

## **Desired Qualifications for a Red Hill Groundwater Modeling Team**

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The groundwater and flow and transport models are the data and visualization product upon which risk based decisions will be made. The Moanalua/Red Hill/Halawa area provides approximately 25 percent of the drinking water for urban Honolulu. This area is also the site of a massive fuel storage facility separated from the groundwater by 100 to 200 feet of fractured rock. It is critical that water resource planners, environmental regulators and managers, and water utility owners and operators have an adequate groundwater characterization to develop proper response measures should a catastrophic release occur. The team doing the groundwater study and associated modeling needs to understand Hawaii hydrogeology, the fate transport processes of fuel transport in all of the phases (i.e. free product, vapor, LNAPL and dissolved), and more importantly the limitations of modeling. Since it is likely that the Red Hill AOC process will be litigated the need for a very defensible groundwater risk study needs to be done by a team that has credibility with the stakeholders and public. Below are listed the desired qualifications for a groundwater risk assessment/modeling team (The Team).

1. The Team must have credibility with the primary stakeholders and the public. The primary stakeholders include:
  - a. The Navy,
  - b. The Hawaii Dept. of Health,
  - c. The U.S. Environmental Protection Agency,
  - d. The Dept. of Land and Natural Resources,
  - e. The Army, and
  - f. The Honolulu Board of Water Supply.
2. The Team must have a superior understanding of Hawaii groundwater flow dynamics and hydrogeology supported by a history of previously successful investigations. The scale of the groundwater risk assessment/modeling problem is regional rather than confined to a specific site. The primary regional problem deals with the degree of water exchange between adjacent aquifers. More specifically, does groundwater that is potentially impacted by a release from the Red Hill USTs remain in the Moanalua Aquifer only impacting the Red Hill Shaft; or is there a flow component toward the Waimalu Aquifer where major municipal pumping centers are located?
3. The Team should have a track record of developing Hawaii groundwater resource assessment models on a regional scale. The groundwater flow, and fate and transport model should not be the primary means of investigation. A model is only as good as the data and skill that goes into the development. However, the model is the product that allows visualization of the results of the groundwater investigation and is the tool for risk mitigation planning. Thus the model becomes the most important product of the investigation. For the model to have credibility The Team must have a proven track record in groundwater resource and risk assessment modeling.

4. The Team should be able call upon assets with demonstrated expertise in other disciplines such as geophysics, geochemistry, and structural geology. If there is a significant groundwater flow component from the Moanalua Aquifer to the Waimalu Aquifer it is due to unidentified subsurface structures. The Team needs to be able to evaluate whether or not it is likely that these structures exist. If the investigation concludes a high likelihood that these structures exist, The Team should be capable of developing a plan to investigate the distribution and geometry of these structures.
5. The Team should have demonstrated expertise in multiphase fate and transport assessments. The drinking water risk assessment must include an assessment of fugitive fuel in its various phases that include free petroleum product in the vadose zone, vapor phase, light non-aqueous phase liquid (LNAPL) phase on the water table, and dissolved phase in the groundwater. The Team needs to have capability or be able to call upon assets to characterize a fuel release from the time it leaves the concrete cocoon surrounding the steel tanks until the dissolved and LNAPL plumes reach steady state, effectively becoming immobile.